Claims

1. An X-ray tube (10) in which an anode (20) and a cathode (30) are disposed opposite each other in a vacuumized inner space (40), electrons (ē) being able to be produced at the cathode (30), being able to be accelerated to the anode (20) by means of impressible high voltage, and X rays (γ) being able to be produced at the anode (20) by means of the electrons (ē), the X-ray tube (10) comprising a multiplicity of mutually complementary acceleration modules (41,...,45), each acceleration module (41,...,45) comprising at least one potential-carrying electrode (20/30/423/433/443), a first acceleration module (41) comprising the cathode (30) with electron extraction (ē), and a second acceleration module (45) comprising the anode (20) with the X ray generation (γ),

wherein

the X-ray tube (10) comprises at least one further acceleration module (42,...,44) with a potential-carrying electrode (423/433/443), the acceleration module (42,...,44) for acceleration of electrons (e⁻) being repeatedly connectible in series as often as desired, and the X-ray tube (10) being of modular construction.

- 2. The X-ray tube (10) according to claim 1, wherein the difference in potential between each two potential-carrying electrodes (20/30/423/433/443) of adjacent acceleration modules (41,...,45) is constant for all acceleration modules (41,...,45), the final energy of the accelerated electrons (e⁻) being a whole-number multiple of the energy of an acceleration module (41,...,45).
- 3. The X-ray tube (10) according to one of the claims 1 or 2, wherein at least one of the acceleration modules (41,...,45) has a reclosable vacuum valve (531) and/or vacuum seals on one side or on two sides.
 - 4. The X-ray tube (10) according to one of the claims 1 to 3, wherein AMENDED PAGE (March 28, 2006)

the acceleration modules (41,...,45) include a cylindrical ceramic insulator (53).

- 5. The X-ray tube (10) according to claim 4, wherein the insulating ceramic (53) has a high-ohmic interior coating.
- 6. The X-ray tube (10) according to one of the claims 4 or 5, wherein the ceramic insulator (53) comprises a ridged exterior structure.
 - 7. The X-ray tube (10) according to one of the claims 1 to 6, wherein the anode (20) comprises a target for X-ray generation as well as an emission hole (201) for X-radiation.
- 8. The X-ray tube (10) according to one of the claims 1 to 6, wherein the anode (20) includes a transmission anode, the transmission anode closing off the vacuumized inner space (40) toward the outside.
 - 9. The X-ray tube (10) according to one of the claims 1 to 7, wherein the electrodes (20/30/423/433/443) of the acceleration modules (41,...,45) include a shield (412,...,415) for suppression of the stray electron flow on the ceramic insulator (51).

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- 10. The X-ray tube (10) according to claim 9, wherein at least one of the electrodes (423/433/443) and/or shields (412,...,415) comprises spherically or conically designed ends for reducing or minimizing the field peak at the respective electrode (423/433/443) and/or shield (412,...,415).
- 11. An irradiation system (60), wherein the irradiation system (60) comprises at least one X-ray tube (10) according to one of the claims 1 to 10 with a high voltage cascade (62) for voltage supply of the X-ray tube (10).
 - 12. A method of production of an X-ray tube (10) according to one of the claims 1 to 10, wherein the X-ray tube (10) is produced in a one-step vacuum soldering process.

AMENDED PAGE (March 28, 2006)

Abstract

Modular X-ray tube (10) and method for the production of such an X-ray tube, in which an anode (20) and a cathode (30) are arranged in a vacuumized inner space (40) situated opposite each other, electrons (ē) being produced at the cathode (30) and X-rays (γ) at the anode (20), the X-ray tube (10) comprising a multiplicity of acceleration modules (41,...,45), complementing one another. Each of these acceleration module (41,...,45) comprises at least one potential-carrying electrode (20/30/423/433/443), a first acceleration module (41) comprising the cathode (30) with electron extraction (ē), and a second acceleration module (45) comprising the anode (20) with the X ray generation (γ). The X-ray tube (10) according to the invention comprises at least one further acceleration module (42,...,44) with a potential-carrying electrode (423/433/443), the acceleration module (42,...,44) for acceleration of electrons (ē) being repeatedly connectible in series as often as desired, and the X-ray tube (10) being of modular construction.

(Figure 5)

20

AMENDED PAGE (March 28, 2006)